Goals for this session

During this session, we will

- examine issues supporting the use of online assessment,
- identify some effective practices in preparing and incorporating online assessment into your class, and
- provide you with some practice in using the features of your Course Management System to develop online quizzes, tests, and surveys.

Outcomes for this session

By the end of the session you should

- evaluate your current use of assessment in your teaching,
- identify some approaches to online assessment that are appropriate for your course,
- create a plan for the use of online assessment in a unit of your course,
- use the features of your Course Management System to build online quizzes, tests, and surveys

The Pedagogy of Online Assessment

Student assessment, in general, is a powerful educational tool that can serve both teaching and learning. When used in teaching, assessments can determine if students are learning what they need to learn. Instructors can gauge how well they are doing in presentation of the course material. Simply, instructors know if the students are "getting it". As a result of such investigations an instructor may choose to modify subsequent learning activities, recommend strategies to ameliorate difficulties, or provide feedback that allows the student to self correct or proceed to advanced studies. (Dochy & McDowell, 1997) In learning, assessment motivates and helps students structure learning and study skills. A well-constructed assessment can provide students with cues as to what they need to focus on in order to master the material.

There are basically two major forms of assessment in use today: summative and formative. *Summative* assessment attempts to "summarize" student performance at some point in time, usually in a written test, for example, a final examination at the end of a course. Almost all summative assessments are "high stakes" in that they are attached to a significant event, such as a grade or a minimal level of achievement for admission to a college or university. Most "standardized" tests are summative in nature. *Formative* assessment, on the other hand, provides the student with feedback to facilitate their learning without necessarily being attached to a grade or other "high stakes" event. In formative assessment, instructors can adapt, then, their teaching in order to meet student needs.

Research suggests that formative assessment, while effective, is not used frequently or well in education. (Black and William, 1998) Black and William caution that,

> Actual assessment practices are often harmful: marking and grading are overemphasized while giving useful advice is underemphasized, and comparing students causes low-achieving students to believe they cannot learn. Teachers, it turns out, generally replicate standardized tests in their own assessment practices and therefore lack sufficient information about their students.

Thelwall (2000) provides a convenient taxonomy of summative/formative assessments.

A taxonomy of applications of CBA

Area	Type	Description
Summative	Exam	An assessment for grading purposes
Formative/Summative	Grading test	An assessment for grading, but also provides feedback intended to direct future studies
Formative	Open access test	A grading test that doubles as a set of exercises because students are allowed to practice before sitting at the test
Formative	Self-test	An assessment designed to give students feedback on their progress within a section or unit of study
Formative	Exercises	A problem set designed to consolidate learning on a unit of study
Formative	Programmed learning tool	A linear computer-assisted learning (CAL) package based upon question and answer (Drill and practice)
Formative	CAL quiz	A graded exercise integrated into a CAL package, i.e., a multiple-choice question presented after an informational slide
Formative	Adaptive CAL quiz	A graded exercise in a CAL package used as a test, but also used to adapt the teaching to the weaknesses of the student
Formative	Diagnostic test	An assessment of prior learning taken before a unit of study

Adapted from Thelwall (2000)

Computer-based assessments (CBA) have been used effectively in higher education since the 80's. There are many ways in which to use CBA, from placement tests given before students begin study, to formative assessment during study, and later summative testing in final exams. Such assessments are not considered to be replacements for, but complimentary to, traditional testing methods.

Mastery Learning

Extensive use of "formative" evaluation is found in Mastery Learning techniques. Mastery learning is a method of instruction in which the emphasis is on the role of feedback in learning. Each student must "master" a certain level of performance before moving on to the next section.

The Mastery Model is based on Benjamin Bloom's Learning for Mastery (Bloom, 1968, 1974) and later refined by Block (1974). In the mastery learning technique, material is broken down into a set of subskills which are organized in a hierarchy of instructional objectives. For each step in the hierarchy, a formative evaluation is developed and performance criterion are specified for mastery of the subskill. The learner begins at the lowest level of the hierarchy, is pretested, receives the content, and is posttested. If the learner is unable to meet the specified performance criterion for mastery, corrective strategies are introduced until mastery is achieved. Once mastery is achieved for a subskill, the learner moves to the next level in the hierarchy. The strategy relies on frequent feedback loops associated with well-defined and appropriately sequenced subskills.

Although mastery learning can be adapted to episodic material such as history, it is more effective with sequential material such as math or foreign languages where prior knowledge is essential to success.

Basic Mastery Methodology Using a LMS

Step	LMS	Feature(s)
Give a pretest and present a review of the material at the beginning of the semester. This should address essential facts, skills, and concepts that are required for success. Make adjustments to instructional objectives and content based on the profile of the class.	This is easily accomplished by developing the pretest in the LMS and requiring students to take it at the beginning of the semester.	Due to the automatic scoring feature available in most LMS's, the instructor will have a complete inventory of the skills/abilities of the class before the next class session begins.
Introduction: explain objectives, content, and procedures for each lesson. Explain how the material is related to prior knowledge and experience.	Include a summary in the Course Information/Course Documents section(s) for reference and review.	Prerequisite material, reviews, learning "anchors" can be provided through an array of multimedia experiences.
Present the concept or skill by providing demonstrations and examples.	These can be included in the "content" section of the LMS or examples can be provided that reinforce the material covered in class. Changes in the focus or review is made based on results of the pretest.	
Lead the learner through demonstrations and examples.	Perfect time to use the "Classroom Flip" methodology as described by Baker in Moving to the Next Level.	Present reading, demos, examples using the LMS outside of class. Use class time to answer questions, guide hands-on activity, etc.
Engage the student in the formative assessment where his/her work is monitored, feedback is received, and performance is assessed for corrective action or for advancement.	Develop assessments based on a hierarchy of subskills. Set a level of mastery. Provide remedial activities for those in need. Provide advanced materials for high achieving students.	Use of feedback capabilities of the LMS to guide the student. Automatic scoring allows the instructor to focus on student progress and needs rather than just "marking".

Before we move to a consideration of the special characteristics of online assessment, take a few minutes to assess the role that evaluation plays in your teaching. After you have thought about the following questions, then share them with your neighbor and listen to his or her thoughts.

Question	Your Thoughts
How are you assessing your students now? Do you feel that you have enough information to be able to determine if your students are "getting it"?	
If you were aware that your students, across the board, were having difficulty grasping a particular concept, task, or assignment, would you be willing to change your approach mid-stream in order to meet your students' needs? How would you know? What about individual students?	
Have you ever considered an incremental approach in your course that moves the student through a series of substeps toward final a learning objective? What are the advantages and disadvantages of using this approach to learning? How might such an approach be facilitated through the use of online assessment?	
How important is it to provide frequent, relevant feedback to your students on their progress? What are the impediments to giving your students feedback more consistently and more frequently?	
How much time do you spend marking quizzes and tests? Would you assess your students more often if you did not have to do this?	

Effective Practices in the Use of Online Assessment

Advantages of online assessments

Instructors can assess progress of their students more frequently

Computers excel at storing and retrieving data. Using these capabilities, instructors are able to assess student progress more frequently often without giving up valuable class time. Computers relieve the instructor of administering, scoring, and recording the results of assessments. This is done automatically. The instructor is able to walk into the classroom knowing who has completed the quiz (often an indicator of who has done the reading assignment) and which items were missed by the majority of students.

Students are able to monitor their own progress

Student self-monitoring is essential to metacognition, which enables students to adjust and manage their own learning which is positively correlated with study practices and ultimately achievement. (Paris & Winograd, 1990)

Feedback is provided to students immediately

Feedback is information given to the learner about the correctness of their answers. (Frayer & Kluasmeier, 1971) Immediate feedback is more effective than feedback delivered after a delay. (Dempsey, Driscoll, & Swindell, 1993). In some classes students don't find out how they've done until long after a concept has been taught. If they get quizzes back 3-4 weeks later, they lose interest (especially in large classes). Immediate feedback enables the learner to monitor their understanding leading students to remedial study or to seek help when errors are identified rather than waiting. An additional benefit of immediate feedback is that it encourages students to keep working on problems that are giving them trouble. Instructors using CBA may choose to provide item by item feedback or feedback at the end of the test. Using the tools found in most course management systems' assessment managers, instructors can provide students with feedback not only on whether the answer was correct or not, but why.

Allows inclusion of multimedia elements not possible in paper assessments

Computer-based assessment enables instructors to present multiple media as sources for assessment easier than any other format. Students can be presented with sound, video, and animation and the capability to input text all from one format.

Statistics and other reports can be generated automatically

Most learning management systems allow statistics to be collected and displayed automatically for both individual users and for the entire class. Again, this is a time saver for the instructor. When using CBA, students are able to receive their grade immediately after taking a quiz or test. This was the highest ranked advantage of using Blackboard as reported by students responding to an on-line survey of likes and dislikes of Blackboard conducted at Baldwin-Wallace College during Spring 2000 and Fall 2001 semesters (Mentch, 2001).

Electronic Delivery of Tests and Quizzes

Question Banks/Pools

One feature that is available through electronic delivery of tests is that of question pools, sometimes referred to as question banks. In this summary, these terms are meant to be used interchangeably, although they will be consistently referred to as "pools" in the following discussion.

A pool is a collection of questions from an assessment that enables the computer to either generate the assessment based on certain criteria (example, all questions categorized as "advanced") or in a randomized fashion. The randomization feature may enable the instructor to develop an assessment pool to generate tests that can be used year after year without ending up in the "fraternity test file" or to prevent "sharing" between sections of the same course or even cheating within the same course. Creation of pools, however, is not trivial and demand a significant investment of time by the instructor. One strategy may be collaboration among faculty within a specific discipline who teach common courses to share questions so that the pool can be developed in less time than if done individually.

Some LMS's allow variables to be used within a question so that the question is basically the same for everyone except for the values provided. These parameters can be either selected from a list developed by the instructor or generated by the computer randomly or according to a preassigned formula.

Objective Tests

Frequently, a Learning Management System's testing capabilities are optimized for creating objective type questions. This would include multiple choice questions (MCQ), matching questions, true-false, multiple response questions, sequencing, and ranking type questions. In these types of items, the answers are chosen from or compared to other items provided. Scoring of such items can be performed easily by the computer as judgment about correctness of the answer does not have to be made since correct answers have been predetermined. Objective type tests are popular and frequently used in higher education settings mainly due to their efficiency, especially for large classes. Objective type questions have been criticized, however, primarily due to the fact that they do not adequately assess "higher order skills". Other limitations in using objective tests must be considered. Good objective tests are the exception, not the rule, as their design requires skill and experience.

When using computers to deliver objective tests, students must be familiar and comfortable with the technology and contingency plans must be addressed in the event of computer failure.

In the following paragraphs, a short description of the major objective question types will be provided as a starting point for developing good objective style tests and quizzes.

Multiple Choice Questions (MCQ)

Multiple choice type questions and their variants are the most commonly used objective question type and are frequently found in online assessments. In this type of question, the student is required to choose the correct answer from the list provided. In multiple choice questions, as in most objective question types, several specific "parts" can be identified. These include:

1) Stem: this is the question narrative.
   Example: Who wrote the "Star Spangled Banner"?
2) Options: these are the individual choices provided by the designer of the test. The options can consist of one or more than one correct answer (s).
   Example:
   a) Roger Daltry
   b) Benjamin Franklin
   c) Francis Scott Key
   d) William Harrison
3) Key: the correct answer in the list of choices.

Example: c) Francis Scott Key

4) Distracters: the incorrect answers in the list of choices.

Some recommendations for creating good multiple choice questions:

- Make sure that there is only one possible answer in the list provided when using single answer multiple choice type questions
- Provide only "plausible" distracters (using Roger Daltry above may not be the best choice as a distracter when asking about the "Star Spangled Banner")
- Avoid giving "clues" to the correct answer
- Avoid using "all of the above" or "none of the above" unless these answers are occasionally correct. Test takers are smart, they will eventually be able to quickly eliminate these if they are never the correct choice.
- When preparing summative evaluations, use incorrect answers that appear with high frequency from the formative evaluations as "distracters".
- Do not try to "trick" students by using distracters that are extremely close to the correct answer.
- Although it is commonly thought that four choices are best, there is some evidence that three choices may be sufficient (Brown, 1997) Remember that the more choices you provide, the more difficult the question becomes.

Variations of MCQ

True/False

True/False type questions are a variant of multiple choice type questions frequently found in online assessments where there are only two possible choices. Such questions assess the student's ability to identify assertions of accuracy regarding statements of fact. While this format offers a very efficient way to test understanding of a large number of facts, it does have several significant limitations. Such limitations include:

- There is a 50/50 chance that the student will be able to guess correctly
- It is often difficult to generate a completely "clean" true or false statement
- The format does not allow as in-depth comparisons of student abilities as other formats

Other variations of MCQ found in Online Assessments

Matching Questions

Matching items require students to match a series of short statements in one column to a particular idea/answer in a second column.

Multiple Response Questions

Another variation of the MCQ where the student is permitted to select more than one answer.

Example:
Which three airlines service Cleveland Hopkins Airport?
__ Continental
__Air France
__Air Canada
__Southwest
__TWA
__United

Beyond Recognition to Recall

Fill in the Blank/ Short Answer

Fill in the blank and short answer questions require the student to generate a response from recall rather than just recognition. The following is an example:

The term_____ means occurring sometime after birth, while _____ means present at birth.

Example from: Owens, Metz, & Hass (2000)

- One significant problem in using this format is that you must tell the computer all possible combinations of correct responses. For example, ADVANTAGEOUS and advantageous are not equivalent unless you tell the computer so. This makes the design of this type of question tedious to say the least. Would you accept Francis Scott Key, francis scott key, Frances Scott Key, and Francis-Scott Key all as correct responses? This is easily accomplished using hand scoring, but not for the computer.

Essay Questions and Exams

Most Learning Management Systems have the capability to accept essay type questions, however, they cannot be automatically scored. Why, then would you want to use it? Frequently student handwriting in a "Blue Book" format is almost illegible. Having the student "type out" the essay is a life (and eye) saver for both the student and the instructor.

Issues in using online testing and assessment

- The equipment must be reliable. Crashing in the middle of a final examination is not good. Another reason why this capability is better used for formative rather than summative evaluations.
- Online test construction is VERY time consuming. Make sure that you allow plenty of time for development.
- Particularly in Blackboard, it is difficult to delete an item from a quiz or test after is has been completed, you must start from scratch, and this is very annoying. You are able to edit/modify individual items , however. Blackboard has fixed this problem in version 5.
- Security is an issue. Is the person sitting behind the monitor really the student in your class?

Tips and Suggestions for using online quizzes and tests

- Make online testing formative rather than summative.
- Give students a short (3-5 questions) quiz before each class session to assure that they are completing the reading assignment. Go over common errors.
- Enlist others in your department/discipline who teach common courses to share the responsibility for creating a question pool.
- Use frequently chosen incorrect answers in MCQ as distracters in summative evaluations (you have addressed these in class or online!!)
- Consider a mastery approach with subsets of skills to be "mastered" before moving on. Provide plenty of feedback.
- Give students occasional online "pop" quizzes to see if they are "getting it". Go over any common problem areas.

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